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Second Review of a New Data Management System for the Social Security Administration

A Report to the
Social Security Administration
Department of Health, Education and Welfare

by the
Panel on Social Security Administration
Data Management System
Board on Telecommunications—Computer
Applications
Assembly of Engineering
National Research Council

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

This report represents work under Contract 600-78-0050 between the National Academy of Sciences and the Social Security Administration.

Copies of this publication are available, under accession number NRC/TELECOM/79/1, from

National Technical Information Service
Department of Commerce
5825 Port Royal Road
Springfield, Virginia 22161

Printed in the United States of America

Preface

This report is the second in a continuing review of the planning being done by the Social Security Administration (SSA) to develop a new data management system to support its service delivery process. The review was undertaken at the request of the Social Security Administration, and follows by one year a review by a similar panel of the Board on Telecommunications-Computer Applications, National Research Council. That panel's report, Review of a New Data Management System for the Social Security Administration, published in 1978, examined the planning done by the SSA through 1977 and discussed such technical issues as data base design. This second report reviews the planning done through 1978 and deals with issues that have more of a management and planning orientation. For each review, the panel consisted of 12 members, 8 of whom participated in both reviews.

The second panel was asked to assist the Social Security Administration by examining such aspects of the agency's effort as: privacy and security, project control, and the development of plans for system design and for system transition. During 1978, the members reviewed the effort with the SSA staff at six panel meetings and numerous subpanel meetings.

The report begins with an introduction and summary of the panel's principal findings and recommendations. Chapter II provides the background about the subject, delineates the dimensions of the SSA's data management problem, summarizes the major conclusions of the panel's first review, and describes the federal government's policies for acquiring large computer systems. Chapter III concerns the SSA's strategy for acquiring its new system and its need for project management planning. Chapter IV develops in some detail the options available to the SSA as it plans for the transition from the present process to a future one. Chapter V concentrates on the importance of incorporating privacy and security safeguards in the new system. Finally, in Chapter VI the panel discusses some significant human factors issues.

The panel has benefited greatly from open, frank, and informative discussions with officials and staff of the SSA. Appreciation is expressed, in particular, to Stanford Ross, Commissioner of Social Security, Don Wortman, Acting Commissioner during part of the review, and Robert B. Bynum, the Associate Commissioner for Program Operations during the period of the review, as well as to Ray Lannon, the Director

of the Office of Advanced Systems, and to Renny DiPentima, the Project Officer. The panel is grateful to them and their associates for guiding the panel toward an understanding of the nation's social security process and for their receptivity to new ideas and alternative approaches.

Several members of the panel called on colleagues for contributions to this review. The panel is indebted, accordingly, to the following: Bob Gant of MCI Telecommunications Corp., Neil Lamb of the National Aeronautics and Space Administration, Richard Matteis of Citibank, and Richard Snowden of the American Telephone and Telegraph Company. While the panel acknowledges the valuable contributions of these people in its review, the conclusions and recommendations presented in this report are its own.

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CHAPTER I

Introduction and Summary

Since 1975, the Social Security Administration has been planning the complete redesign of its data management system. This report reviews the planning accomplished through 1978 to develop and implement a future process. The SSA "process" refers to the management and operational techniques and activities through which the SSA does its work and meets its responsibilities. Background information about the present process is contained in Chapter II, together with the outline of an SSA design concept for its future process.

In the panel's earlier review, it examined the system design concepts then being considered by the Social Security Administration. In its first report, the panel concluded that the cornerstone of the SSA system design should be modularity--the use of separable subsystems with well-defined interfaces--so that the new system will have sufficient flexibility to accommodate the demands of future legislation. The first report noted that no major breakthroughs in technology are necessary. It recommended that the data base be structured so that it could be distributed geographically as a safeguard against a major failure or breakdown. The first report also emphasized the importance of several topics that are themes of this second report--planning for transition, provision for privacy, security, and confidentiality and the vital consideration of human factors.

During its second review, the panel focused on the planning being done by the Social Security Administration

- to develop its strategy for the acquisition of a new system,
- to move without interruption from the present process to the future one,
- to provide for improved protection of privacy and improved security in the future process, and
- to take human factors considerations more fully into account in the future process.

In developing its strategy for acquisition, the SSA is required to take into account two major federal policies that now govern the acquisition of major computer-based systems by the federal government. The first is Public Law 89-306, known as the Brooks Act of 1965, which directs the Administrator of General Services to coordinate federal acquisition of automatic data processing equipment and to do so economically and efficiently. The second is the Office of Management and Budget (OMB) Circular A-109, Major Systems Acquisition, dated April 5, 1976, which directs federal agencies to follow a broadly specified acquisition procedure that emphasizes the competitive exploration of alternative system design concepts to satisfy approved mission needs. OMB Circular A-109 requires the SSA to shift away from its previous intention to develop detailed specifications and designs, and proceed toward the development of mission requirements, broad functional specifications, and criteria for the evaluation of designs. Under A-109, the development of detailed specifications and design is to be done by contractors. The panel recommends that SSA organize its planning for the acquisition around two documents--a management plan and a project plan. The outlines of both of these plans may be found in Chapter III, along with additional comments by the panel on system acquisition.

Planning for transition is of particular significance because it affects nearly all other aspects of the new system, including system design and acquisition. Transition planning can be useful in harmonizing the necessary interim upgradings of the present system with the acquisition and introduction of new equipment for the future system. In an effort to coordinate its short term and long term planning efforts, the SSA in 1978 developed a tentative architecture 1/ for the future system based on the design concept 2/ that it had defined the previous year. The panel supports that action and also supports the SSA's establishment of user groups, consisting of SSA operating personnel, to advise on problems that they perceive are likely to arise during the transition period.

During its review, this panel examined alternative approaches to transition--the sequence in which services would be activated in the future process. "Services" are defined as the major categories of work --such as the assignment of social security numbers, the adjudication of claims, and the payment of benefits. In one approach, the individual SSA services would be introduced one at a time throughout SSA. In another, all services would be introduced at only one or at most a few locations and later extended together over the entire system. In a third approach, the supporting subsystems--such as telecommunications, data base, and terminals--would be upgraded one at a time. These alternatives are examined in detail in Chapter IV.

The panel has examined in some detail the question of whether vendors could perform all SSA operational services at a limited number of local offices during the competitive demonstration phase of acquisition. The panel concludes that if the task were simplified so as to include something less than all possible exceptions to the general rules, demonstrating a complete system might be feasible. Further analysis of the state of the SSA's data elements and application

programs appears necessary before reaching a firm conclusion. The panel expects the major problems of transition to relate to the conversion of the data base, the concurrent operation of the old and new processes, and the attitude of operating personnel toward the new system. The panel recommends that the SSA mount an effort to define its data elements, to clarify the state of its application programs, and to continue to include representative "users" in its planning process.

The SSA has commissioned detailed studies of privacy and security matters and of human factors as these relate to the future process. It is important that the results of these studies be applied early in the system design and on a system-wide basis. Privacy and security considerations are the subject of Chapter V, and human factors the subject of Chapter VI.

In safeguarding the privacy of personal records and information, a good start has been made. The SSA will still need to make a judgment as to the risks and threats the future system will face, enunciate a clear policy on the safeguarding of information, establish requirements for system safeguards and management controls, and ensure that vendors incorporate the required safeguards. These steps will be necessary to comply with the Privacy Act of 1974 and with Circular A-71 of the Office of Management and Budget on Security of Federal Automated Information Systems.

For its human factors effort, SSA has established a Test and Evaluation Facility to provide a laboratory in which to study the dynamics of such situations as client interviews, as well as interactions between claims representatives and a data base. This facility has the potential to play a major role in acquisition and transition as well, for it is capable of making preliminary tests and demonstrations of software, terminals, and local processing facilities before these components of the future system are introduced into the field offices. The use of such a facility is apparently unique, outside of the Department of Defense, for system development efforts in the federal government. The panel concurs with the SSA plan to conduct human factors research in district offices as well as in its facility. Furthermore, the panel suggests that the SSA consider pursuing a study of clients' attitudes.

Developing a future process presents both opportunities and challenges to the SSA. Computer and telecommunications technologies provide a major opportunity to make the SSA process more efficient and its delivery of services more effective and timely. Moreover, developing a future process also provides SSA an opportunity to return to fundamentals--to the legislation where necessary--and to rethink the entire process in order to make sure that it is responsive to the essential requirements that arise from legislative mandates and executive regulations and not to procedures and methods that have been adopted only to overcome discernable system inadequacies in the past. There also are opportunities to rethink the methods and procedures for monitoring the performance of the process, so that it can be made more responsive and controllable, and to build a system of sufficient flexibility that it can adapt easily to requirements to be imposed in

the future, even those that are not now forseeable. Finally, there is the challenge to create a future process that exploits the computer-communications technology in ways that call forth the best efforts of the people who will actually use it, to the benefit of the entire nation.

CHAPTER II

Background

THE EXISTING SYSTEM

Since the passage of the Social Security Act in 1935, the SSA's responsibilities and workload have grown, largely as a result of legislation, far beyond those envisioned by the 74th Congress. Today, the SSA's programs cover 111 million of the nation's workers, and in fiscal year 1978 the SSA paid nearly $103 billion in monthly cash benefits to more than 37 million people.

SSA administers the Retirement and Survivors Insurance and the Disability Insurance programs, the Supplemental Security Income program, and part of the Health Insurance program.* While the SSA manages the Aid to Families with Dependent Children program, it is administered through a network of state welfare offices and payment organizations. For the programs it administers directly, SSA provides more than 400 services that can be grouped into the following eight categories: the granting of social security numbers, maintenance of earnings records, claims, payments and settlements, appeals, changes in status, data exchange with other agencies, and general inquiries and information.

The SSA operates 1,300 permanent local offices, 3,400 additional part-time local offices, 30 telephone service (teleservice) centers, 7 program service centers (including one in Baltimore that handles all disability cases), a special facility for foreign cases, 10 regional management offices, and a central computer complex in Baltimore, Maryland. There are nearly 80,000 full-time SSA employees. Over 50 agencies of the states and territories employ some 9,500 employees to determine disability issues.

The local (district and branch) offices and teleservice centers are the primary points of contact with the public for the delivery of social security services. The 7 program service centers review complex claims, maintain beneficiary records, and perform functions that are required because of the SSA's reliance upon paper records, and because data base and systems inadequacies require that the more complex claims and change-of-status actions receive special manual handling.

*The 1977 reorganization of the Department of Health, Education, and Welfare removed most Medicare functions from SSA jurisdiction. Those functions that remain include computer support services and such client-related services as enrollment, claims taking, and collection of health insurance premiums.

The main computing center in Baltimore consists of several separate computer systems, generally aligned in support of separate legislated programs. Each computer system maintains its own data base, mainly on magnetic tape. Most inter-system communication is accomplished by moving tapes from one system to another. Supplementary security income data and some retirement and survivors insurance data are made available to field offices from on-line disk files in a real-time, direct-access mode, but most of the files are off-line. Some field offices are linked to the central complex and to each other by a data telecommunications network, others by a teletype network. As its responsibilities have increased over the years, the SSA has absorbed additional workloads on an ad hoc basis by increasing the number of its personnel and the capability of its computers.

PLANNING A FUTURE SYSTEM

In December 1974, President Ford, responding to an SSA request for additional personnel, urged the Secretary of Health, Education, and Welfare to search for more comprehensive and durable solutions. The President directed the agency to prepare a plan for an automatic data processing system using advanced computer technology. The Commissioner of Social Security then established the Office of Advanced Systems (OAS) to design and develop a service delivery system that would maximize efficiency, curtail increasing personnel requirements and administrative costs, improve service to the public, and maximize the utilization of the most advanced technology.

In its "Recommended Design Concept for the Future SSA Process,"2/ the OAS outlined in 1977 a design concept that emphasizes on-line, integrated data base techniques, and whose major features are that:

- Local offices would continue to be the primary point for dealing with the public.
- All claims for cash benefits and post-entitlement events would be received at local offices.
- Claims would be adjudicated at local offices in most cases although hard-to-process and selected high-risk claims and changes would be processed at a specialized facility.
- On-line files would be used extensively to provide for immediate access to the data base and for interactive processing when desirable and cost effective.
- Safeguards would be built into the system to guarantee the privacy and confidentiality of client information.
- The process would incorporate the "whole-person" concept --the integration of all the records of each individual client in order to make it possible to transact all current business and render all applicable services to a client in a coherent manner.

The Office of Advanced Systems projected that the first module of the new system would be in place in 1982, and that the complete system would be operational in 1985. It estimated that the total one-time cost of the new process would be $560 million, and that it would yield an annual saving of $300 million beginning in 1985.

PANEL REVIEWS

During 1977, the panel reviewed the OAS planning, and in its first report, issued in 1978, the panel

- Described the major technologies that SSA should consider in developing its new system,
- Outlined the major decisions that needed to be made about the architecture of the data base,
- Emphasized the importance of such system consideration as transition planning, human factors, and privacy and security.

The panel concluded that:

- The cornerstone of good system design is modularity, using subsystems with clearly defined interfaces.
- No technological breakthroughs are necessary, nor are custom-made hardware components required--though some new software will be.
- The data base should be structured in such a way as to enable it to be distributed to several geographic locations, to provide redundancy for continued service in the event of a localized breakdown or catastrophe.
- The telecommunications subsystem should be a separable module in the sense that it have simple interfaces with the rest of the system, and not contain functions that are clearly processing rather than telecommunications.

For this second report, the panel reviewed the continuing planning by SSA, and in particular: its strategy for the acquisition of a new system, its planning for transition from the present process to the new one, and its efforts to plan for privacy and security and for the whole range of human factors considerations.

During the period of this review (roughly, calendar year 1978) SSA's Office of Advanced Systems commissioned independent studies by contractors on four significant subjects: human factors, privacy/security/freedom of information, systems engineering, and data base design. The OAS carried its documentation of the present process through three levels of the functional hierarchy, and developed performance specifications for

the future process. In addition, the OAS has been developing a Request for Proposal (RFP) for the system acquisition.

FEDERAL PROCUREMENT OF MAJOR COMPUTER SYSTEMS

Besides the existing federal procurement regulations, two major policies govern the planning for the acquisition of major computer-based systems by federal agencies. The Brooks Act of 1965 (P.L. 89-306) directs the Administrator of General Services to coordinate and provide for the economic and efficient purchase, lease, and maintenance of automatic data processing equipment by federal agencies. This directive has been interpreted by the House Committee on Government Operations to require federal agencies to procure their ADP systems on a fully competitive basis.

The basic policy of the Executive Branch in the acquisition of major systems is set forth in the Office of Management and Budget's Circular A-109, dated on April 5, 1976. It has its origin in a series of recommendations made by a Commission on Government Procurement to the Congress in December 1972 after three years of comprehensive study. Basically, this policy seeks to encourage innovation and competition in the creation, exploration, and development of alternative system design concepts.

OMB Circular A-109 requires federal agencies to pursue a systematic and sequential process in the determination of their requirements and the fulfillment of those requirements through the acquisition cycle. The process requires four specific decisions by the head of the agency:

- Determination that a new capability is required by the agency to fulfill its mission, expressed in the form of a mission need statement.

- Exploration of alternative means of fulfilling the need; the solicitation, where appropriate, from the industrial sector of alternate concepts to satisfy this need; and the selection of the most promising concepts for further exploration.

- Selection of the most promising concept for full scale development based upon adequate competitive demonstration of their merit.

- Selection, where applicable, for full production, of the concept that has been adequately verified through demonstration as fulfilling the agency's need.

Where the mission needs of an agency involve the acquisition of major ADP and/or telecommunications systems, the policies and requirements of the Federal Procurement Regulation and the Federal Property Management Regulations also govern the agency's procurement actions. Temporary Regulation 47, published September 14, 1978 (included as the Appendix to this report) delineates the actions and responsibilities of both GSA and the procuring agency.

In a December 1977 memorandum to the Commissioner of Social Security, the Under Secretary of Health, Education, and Welfare, after reviewing the SSA Advanced Systems Project, stated that it "should proceed without conceptual change or redirection." This memorandum is understood by the OAS staff as constituting approval of a mission needs statement.

CHAPTER III

System Acquisition

In its previous report the panel summarized its advice on the development process as follows:

> Development and implementation of the future SSA process should be in the hands of top management within the agency. Responsibility for the planning, development, and implementation of the process cannot be bestowed on or abdicated to a contractor. One major task for the top management is to organize a coherent and expert team. Other tasks include strengthening and utilizing in-house SSA knowledge and expertise, making good use of consultants, and contracting for support and equipment from companies in the computer, communications, and system architect-engineering fields. The entire program to modernize the process needs to be closely monitored and controlled by the SSA. The panel is sanguine about the inherent capability of computer and communications technology to support the future process. Yet, because of repeated examples of grossly mismanaged large-scale systems, the panel considers it essential that able people and good management structure be mobilized to carry out this development with a maximum guarantee against schedule slippages, cost overruns, and transition problems.

During the review that formed the basis for this second report, the panel examined the SSA's developing acquisition strategy and its planning for the management and control of the development process.

ACQUISITION STRATEGY

The SSA has determined that its acquisition of an advanced data processing system to support the future process is within the purview of OMB Circular A-109. Conformance to the policies enunciated in A-109, however, is by no means a matter of merely following to the letter definitive procedures that have been worked out over many implementations of the policy. On the contrary, Circular A-109 is a new policy, never before applied to an acquisition of the kind that SSA is planning. SSA's future process is something of a test case in which experience will be gained in the application of A-109 to large human-service systems.

Accordingly, SSA should continue to pursue the objective of an acquisition strategy that is not only consistent with the OMB policy but that will result in the most effective and responsive service delivery.

Circular A-109 provides that federal agencies issue a solicitation to industry at the beginning of the exploration of alternative design concepts, and that the solicitation outline the overall acquisition strategy, the specific evaluation criteria for the initial contracting phase, and the criteria for follow-on phases. If enough proposals are deemed meritorious, evaluation of them will result in the selection of two or more contractors to develop and define in detail their recommended system design concepts.

The acquisition strategy that was under consideration by the SSA during the period of the panel's review is outlined in Table 1 (page 12). Essentially the strategy provides for the competitive selection of several vendors to perform preliminary work in two competitive phases at government expense. During the first phase, these vendors will be required to develop detailed designs, and during the second, to demonstrate a "first module." At the end of the two competitive phases the winning vendor will be selected to implement the system. The acquisition strategy that will actually be adopted by SSA will be reflected in its Request for Proposal (RFP), expected to be released in 1979. This has not been reviewed by the panel.

PLANNING FOR ACQUISITION

Circular A-109 imposes several requirements on agencies that plan to acquire a major system. These include

- Development of a mission needs statement
- Designation of a program manager
- Development of an acquisition strategy
- Establishment of clear lines of authority

The panel concludes that to satisfy these requirements, and to ensure the continuity of SSA operations during the transition, the SSA should formalize the interrelated planning that will need to be accomplished by several components of the SSA organization, and that this should be done through two plans or internal contracts:

- A Management Plan to establish overall policy guidance
- A Project Plan to articulate the acquisition strategy and to detail the plan of action for acquiring the new system.

Both plans could be viewed as contracts--the Management Plan as a contract between the Commissioner of Social Security and the Secretary of Health, Education, and Welfare, and the Project Plan as a contract between the Commissioner of Social Security and the program manager.

TABLE 1 SSA's ACQUISITION STRATEGY

PHASE (Duration in Months)	ACTION
Preparation (6)	SSA prepares RFP and solicits informal reaction.
Issuance (6)	SSA formally issues an RFP for a "conceptual architectural design."
Proposals (6)	Vendors submit proposals.
Selection	SSA selects multiple vendors (using Criterion #1*) with highest levels of capability for design of future process.
Competitive Design (12)	Multiple vendors refine their detailed system architectures and detailed designs of the first module. During last 9 months, SSA selects out vendors not achieving requisite performance capabilities (using Criterion #2**).
Competitive Demonstration (6)	Vendors demonstrate a prototype first module (if necessary). SSA selects the future process system designer (using Criterion #3***) to design and implement the total system.
Implementation	Selected vendor designs and tests prototypes of subsequent modules, integrates efforts of other vendors and government organizations, undertakes development of the applications software, and bids on hardware.

* CRITERION #1: Vendors will be judged on a sound and rational architectural design; modeling outputs that verify the architecture's performance; experience with projects of similar size and complexity, and the results of detailed cost and risk analyses.

** CRITERION #2: Evaluation will be based on comparison of detailed designs to SSA modeling outputs; technical performance analysis; satisfying performance specifications; risk analysis (machine costs, benefits analysis, life-cycle costs, etc.), and ability to manage the effort in terms of logistics support, control, staffing, and project management.

***CRITERION #3: The assessment will be based on an actual demonstration of systems capability, including hardware independence of software.

THE MANAGEMENT PLAN

The Management Plan should establish

- Overall objectives for service levels, cost, and time to accomplish
- Mission needs statement
- Constraints on future system design
- Relationships between the present and future systems
- Assignment of responsibilities to the program manager and others in the SSA
- Guidance for supporting plans
- Management approach
- The resources plan
- The management review schedule: Management reviews would normally be held upon completion of significant project events and would not necessarily be tied to procurement actions or budget cycles. Examples of such events include critical design completion and module demonstration.
- Controlled items: These items include items requiring approval at senior management levels before they can be changed and items that would trigger project reviews whenever they deviated significantly from the plan.

THE PROJECT PLAN

The panel considers the development of a comprehensive, fully integrated Project Plan, prior to the commencement of any procurement action, to be the essential prerequisite to successful acquisition. During the preprocurement stage, this is a paramount responsibility and priority of the program manager and his staff.

The Office of Advanced Systems issued the "Master Plan for The Development of The Future SSA Process" in June 1975 3/ and the "Recommended Design Concept for the Future SSA Process" in April 1977.2/ The SSA has engaged in extensive study, analysis, and evaluation of various factors that enter into the planning for its future process. The panel holds that SSA should now proceed with the development of a formal Project Plan to set forth the programmatic, technical, and managerial intentions of SSA. The Project Plan should include:

- Project Plan Summary: A summary of project technical and management approaches, objectives, cost, personnel

requirements, procurement strategy, schedules, environmental considerations, review and approval requirements, and major issues for management consideration.

- Project and Mission Objectives: An outline of specific project and mission objectives and the relationship of such objectives to the basic SSA program needs, missions, and goals. This outline should reflect the mission need statement developed under OMB Circular A-109.

- Related Studies and Activities: A summary of previously conducted studies and related activities and the implications of the results of such efforts for the proposed project.

- Summary of Technical Plan: A summary of the technical considerations essential to the achievement of the project objectives. (This panel's previous report outlined such technical considerations.)

- Procurement Approach: A summary of the approach for procuring major project elements of hardware, software, and other support. This section should address compliance with requirements of Circular A-109 and Federal Procurement Regulations, Title 41, Subpart 1-4.11, "Procurement and Contracting for Government-Wide Automated Data Processing Equipment, Software, Maintenance Services and Supplies."

PROJECT CONTROL

It will be helpful to think of project control as a system--the information system that provides the primary management data for progress assessment, performance prediction, plan variance or problem identification, and informed decision making. Generally, it consists of the review of budgets, schedules, technical performance, and costs.

An appropriate project control system will evolve directly from the planning and will be essential to the evaluation of progress toward achieving the project's principal objectives. The controls will constitute the primary means of assessing progress and will provide a basis for estimating the performance of the ultimate system in comparison with the principal program objectives. The controls should be intimately related to the acquisition strategy for the project and to the performance requirements imposed on the development contractors. To be useful and effective, the controls employed by the SSA should be both compatible and relevant.

Project control data should be on a common basis and compatible for the program management of both SSA and the contractors. One of the best ways to assure compatibility is to organize controls on the basis of a specified work breakdown structure. A single common baseline is essential to provide a meaningful relationship between the various elements of

project control data in order to avoid duplication and prevent diverse conclusions from different bases. When the SSA imposes requirements on the contractor for data regarding progress and schedules, it should consider the practices of the industry and of the particular contractor so that the same data can serve the internal management purposes of both the agency and the contractors.

To achieve relevance, controls imposed on a contractor should be structured to measure the salient features (technical, schedule, and cost) of his particular concept to achieve the project objectives of the SSA. An RFP should identify the management information needs broadly and should specify the basic criteria that the project control system must meet. The range and depth of data required for project management should be directly related to the respective performance responsibilities of the SSA and the contractor. Thus, wherever responsibility shifts to a contractor, the role of SSA would become less a matter of direction and more of detailed monitoring, and the project control system should provide information for assuring proper progress and technical feasibility, rather than for providing unilateral government direction.

The current acquisition strategy of the SSA contemplates competitive development of alternative concepts followed by increasingly detailed demonstrations of concept capability to fulfill the agency's objectives. The purpose of the demonstration phase is twofold: a competitive winnowing and a concommitant, progressive increase of confidence that the surviving proposal will fulfill the mission needs. The end result of this strategy is the selection of a demonstrated concept that offers the greatest value to the SSA.

In any phased procurement, the purpose of the project control system will change during the acquisition process. In the initial concept competition, the project control system should be tailored to provide data to enhance the SSA's understanding during the evaluation and selection of the competitors' concepts. After the ultimate selection of a single concept for development, test, and installation, the purpose of the project control system will change to a progressively more detailed assessment of that concept against the SSA's mission objectives.

The management of change is at the heart of successful project management. Changes in the future system are certain over its development cycle, and their accommodation must be comprehensive, uniform, and efficient. Effective change control is vital to assure the integrity and usefulness of a project control system. For best results, change management should be fully integrated with work authorization and work breakdown structure control.

RECOMMENDATIONS

The panel offers the following recommendations:

- On the basis of the extensive study it has already performed on major technical, procurement, and managerial considerations, the SSA should proceed with the

development of formal management and project plans for the acquisition and introduction of its future process.

- For clear communication between the SSA and the contractors and as a means of assessing status and predicting achievement, the SSA should establish suitable project controls, the character and extent of which should be influenced by (a) the usefulness of their product to SSA, (b) the practices of the industry/contractor, and (c) the relative responsibilities of the SSA and the contractors for system development.

CHAPTER IV

Transition Planning

THE SIGNIFICANCE OF TRANSITION

In its previous report, the panel expressed its concern, which is shared with the Social Security Administration, about the planning for the transition from the present process to the future one. The panel observed:

> The transitional stage from the existing SSA Process to the future one should be given high priority--certainly equivalent to the priority that is being given to the design of the future process.

The Social Security Administration responded by suggesting that transition planning be central to this second review and then by working with members of the panel in a series of ten one-day meetings devoted to analysis of transition problems. The panel has arrived at its recommendations largely through a cooperative effort with the SSA staff, and to a large extent the recommendations have already been adopted or incorporated into the SSA's planning. Even so, a strong follow-up effort is considered necessary to determine the difficulty of reorganizing and unifying the data base and of adapting or rewriting the application programs.

An instantaneous "cut-over" from the present process to the future one is not deemed possible. The panel therefore considers that the objectives of a smooth transition must permeate the planning and design of the future process. Some otherwise desirable future system designs may have to be rejected because they are incompatible with an orderly transition. The future process must be reachable from the present one without loss of continuity.

PROBLEMS OF TRANSITION

The transition to the SSA's future process is likely to be difficult because there is a need for continuity of service even as significant changes take place in the process itself. Difficulties will arise because:

- The SSA process must not be interrupted for any period, but must continue to function throughout the transition.

- The continuity of the content of the data, on which almost all the SSA work relies, must be preserved and available for use, even while new data structures and new storage media are being introduced.

- The communications capability of the future process--to deliver messages and data in seconds, replacing the heavy present dependence on mail between local offices (where the SSA meets its clients) and the program service centers and central complex (where it stores its data)--will allow transactions to be completed during a client's single visit or telephone call, which will in turn generate basic changes in the SSA's work patterns and procedures.

- A large number of SSA people will require training to carry out these new or revised work patterns and procedures.

Task know-how and technical know-how are both essential to transition planning. In order to plan and design the future process it is necessary to fully understand the present process--not just its objectives. It is necessary, also, to bring into the transition planning process the technical expertise of the development contractor or contractors. Indeed, the SSA's task know-how and the contractor's technical know-how will have to be brought into close interaction. That will not be easy to achieve because, in accordance with the principles of OMB Circular A-109, several contractors may be participating in an active competition at the stage when transition planning will have to be made firm.

FRAMEWORK FOR CONSIDERATION OF TRANSITION PROBLEMS

A simple framework in which to discuss the transition problems is illustrated in Figure 1. The framework is constructed in three dimensions. Along one axis are represented the many district offices, teleservice centers, program service centers, and the central computer complex. Along the vertical axis are the various SSA services, such as enumeration, earnings, claims, and payments. Along the third axis are the several subsystems that support the work of the SSA--subsystems such as the terminals and associated minicomputers in the local offices, the telecommunications systems, the data base, and the processing systems in the central complex and regional centers.

One approach to transition is to bring up each of the services (identified along the vertical axis) one at a time in all local offices and other offices of SSA involved in providing a particular service. Only after each service is mastered would another service be introduced. This approach has been referred to as the "horizontal slice" approach because each step in the transition is represented by a horizontal slice of the rectangular solid in Figure 1. Whenever some of the supporting subsystems are not essential to the provision of a particular

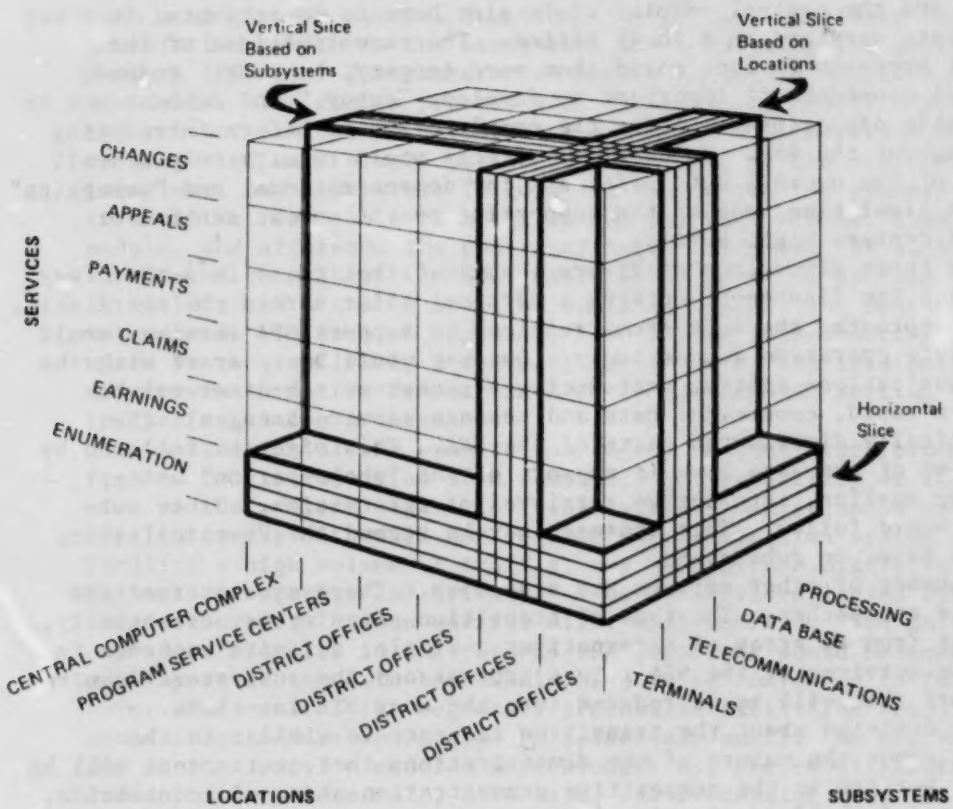

FIGURE 1 Framework for Transition Planning

service, the "boxes" corresponding to the non-essential subsystems may be visualized as empty.

Another general approach to transition is to bring up in a single local office (or in a small group of local offices) all the services rendered by SSA, to master the whole process in that office (or offices), and then to replicate the process in additional local offices until all of the 1,300 or so local offices are operating within the new process. This approach is referred to as the "vertical slice approach based on locations," because each vertical slice of Figure 1 (representing the office locations) is dealt with in succession. The imagery is not entirely valid because some of the functions of the program service centers and the central complex would also have to be activated in order to activate services in a local office. The essential idea of the vertical approach is more solid than mere imagery, however. Indeed, the panel considers it important to develop, "debug," and demonstrate in a realistic operational setting the complete system before introducing it throughout the SSA. A few local offices would require only a small segment of the overall data base, and for demonstrational and "debugging" purposes simulating some of the supporting operations at central or regional centers might suffice.

The three dimensions of Figure 1 suggest that there is a third way of slicing the figure--by cutting a vertical slice across the third axis. In this approach, the subsystems required to support SSA services would be put into operation successively. One way would be to start with the telecommunications system, introducing a packet-switched network to provide a rapid, economical data and message service among all the geographically distributed parts of the SSA. This might be followed by conversion of the data base in support of the "whole-person" concept, providing on-line, interactive retrieval of information. Other subsystems would follow. This approach may be termed the "vertical slice approach based on subsystems."

A number of other options are also open. There are intermediate or hybrid approaches. The task of transition planning is, essentially, to select from an array of alternatives a single, definite sequence in which the services of the SSA future process and the subsystems required to support them will be introduced into the many SSA locations.

The decision about the transition sequence is similar to the decision about the nature of the demonstrations that contractors will be asked to perform in the competitive demonstration phase of acquisition. The nature of the demonstration is important because it could be used to test approaches to the first step in the transition process, and could provide criteria for the evaluation of transition plans. For the horizontal slice approach based on services the competitive run-off required by Circular A-109 is estimated to require about 18 months. Members of the panel who have studied transition problems most intensively have come to the conclusion that the same amount of time would suffice for a run-off based on a vertical slice approach. There is no strong assurance, however, that the full gamut of application programs could be completed in that time. A set of "most frequently used" application programs might have to suffice.

ALTERNATIVE APPROACHES TO TRANSITION

Horizontal Slice Approach Based on Services

An orderly way to proceed toward the selection of a transition sequence is to examine a number of plausible alternative sequences and a number of evaluation criteria. This section briefly describes the alternative sequences that have been examined. A later section lists evaluation criteria.

At the beginning of the panel's study of transition, the dominant approach was the horizontal slice--that is, the transition that starts with a single SSA service function, the primary candidate being enumeration, which is the assignment and accounting for social security numbers (SSN's). The enumeration module is fairly simple and understandable. The future process will be keyed, as nearly everything in the present process is keyed, to the SSN. The enumeration module would be activated as a single horizontal slice out of the block of services, locations, and subsystems (Figure 1). Following the enumeration module, it would be reasonable to bring up the earnings module, then the claims module, and afterward the post-entitlement modules. As each module is introduced throughout the SSA, users would learn to operate with it, and it would reach a stable level of operation before the next module is introduced. In such an approach, however, trouble-shooting expertise would be geographically dispersed; furthermore, the interaction between modules would not be demonstrated in an operational setting until late in the transition process.

Activation of the enumeration module in the future process would require the introduction of a communication capability or the augmentation of the present capability, but--since enumeration is not at all data intensive--it would not require a communication system capable of handling a high volume of traffic, nor perhaps one highly developed with respect to security and privacy. Indeed, services leased from a value-added or primary common carrier might well suffice. The initial requirement for terminals in the various SSA locations would be modest. Only a small part of the data base would have to be converted to future process form. The central (or regional) processing facilities required by the enumeration module would also be relatively small. As the second, third, and further service modules were brought up, the requirements for communication, terminals, data base, and processing would increase progressively, and there would be an opportunity to master each module throughout the SSA as a stable basis for taking the next step.

Vertical Slice Approach Based on Locations

After many discussions and much analysis, the panel considers the vertical slice approach based on locations to be strongly competitive with the horizontal slice approach. The focus of the vertical slice approach is the local office--the main point of contact between the SSA and its clients. The vertical slice approach based on locations involves bringing up the entire future process, or at least a very substantial part of it, first in a single local office or a small group of such

offices. Only after it has been successfully demonstrated there, would the future process be extended progressively throughout the SSA.

At first, the panel found this approach difficult to accept. The overall process had been viewed as being extremely large and enormously complex in the sense that individual processes are strongly intertwined, contain many interfaces, and share many data elements. However, experience with transition from an old process to a new one in other situations has shown that--to the surprise of many--a system that is first viewed as very large and complex may turn out to be very large but fairly straightforward. The key consideration is complexity, not size. The panel is confident that the technology has advanced to a point where a large data base, even one as large as the SSA data base, is manageable if properly organized.

The panel's analysis of the problem has increased its confidence that it would be feasible to bring up, in the initial step of development and transition, a fairly comprehensive system--one capable of handling all the main social security services for a single local office or a few local offices. If that is done successfully then it would surely be a straightforward (though extensive) undertaking to replicate the system horizontally across the whole array of SSA locations. Therefore, the panel has become increasingly confident of the feasibility of the vertical slice approach based on locations.

Vertical Slice Approach Based on Subsystems

The approach based on bringing up one subsystem at a time--for example, first the telecommunications network and then the data base--has not been examined as thoroughly as the other approaches. It appears possible, for example, to introduce a modern telecommunications service that would accustom SSA personnel to fast-response message and data transfers without actually developing a new, unique telecommunications network. The SSA could simply subscribe to an available commerical network and, whenever it is necessary to protect confidentiality, it could use end-to-end encryption for message and data content. A modern telecommunications service would speed up access to records of all kinds, paper as well as electronic. Achieving such a service would require additional terminals over and above those now associated with the SSA Data Acquisition and Response System (SSADARS), the telecommunications and processing system now in use.

A crucial step in this subsystem-by-subsystem approach to transition --and indeed in all the approaches--is the conversion of the data base. At present there is no single, integrated SSA data base. Instead, there are several separate ones, each supporting its own particular processing activity. It seems not only possible but essential to convert the separate data bases into a single, integrated one, capable of supporting the several SSA services effectively, efficiently, and in such a way that all the pending business with a client can be conducted in a single session. Obviously, conversion/integration of the data base will be a large and very demanding undertaking, requiring special facilities, including, very probably, a computer system with software designed

specifically for the purpose of analyzing, reconciling, and reorganizing data with diverse formats. This problem is examined more fully below.

Given a telecommunications network, an initial set of terminals, and an integrated data base, the next step in a vertical slice approach based on subsystems is to update the application programs and the work procedures into which the application programs feed information. That the application programs operate, for the most part, with records stored serially on magnetic tapes means either that the old data base on magnetic tape and the new (to a large extent on-line) data base would have to be used concurrently over a period of time, or that data from the new data base would have to be converted to the forms that the old application programs require. The upgrading of work procedures and the application programs would be left to the end, and would proceed as rapidly or as slowly as the amenability of the situation and tolerance for change would permit.

Hybrid Approaches

It seems unlikely that any one of the three approaches will turn out to be applicable in the idealized form that has been described here. There are many possible departures from these idealized forms, and each of them in some sense constitutes an alternative approach. In the case of the horizontal slice approach based upon services, one of the main criticisms is that the enumeration process is neither typical nor demanding, and that it would be better to start with two, three, or more services in order to provide a more valid test of the capabilities of the competing contractors. Another variation of the horizontal slice approach is to start out in one group of local offices with enumeration, in another group with earnings, and so on, thus moving somewhat diagonally, with a reduced demand for adjustment to change at any one location, and with an opportunity to debug different parts of the new process in different places.

One possible variation of the vertical slice approach based on locations would be to implement only the main or the most frequently used parts of the new process initially, so that the experience of adjustment could be less traumatic. Yet such a variation is essentially a withdrawal from the principle of testing system integration by bringing the overall system into operation at the outset.

In the vertical slice approach based upon subsystems, terminals--and at least the minimal processing associated with terminals--could be introduced into local offices in order to take advantage of a modern communications network. In this approach, beginning the conversion/integration of the data base need not wait until the communications system and terminals are in place. As a result of such hybridizing, the SSA process could be thoroughly modernized with respect to data organization and transmission but could still be carried out as it is now and could use existing application programs. This methodology would enable the SSA to effect the transition in work procedures as gradually or rapidly as thought desirable.

Should the Application Programs be Revised or Rewritten?

To move from the old process with its several separate tape-oriented data bases to the future process where much of the data would be on-line and all of it under the control of an integrated data management system, it will be necessary either to revise the application programs rather fundamentally or to rewrite them from scratch. Which of those alternatives should be pursued? The answer depends upon the number, size, complexity, and present condition of the application programs.

On the basis of hard-learned experience, software experts dread the revision of programs that are large, complicated, and poorly documented. It is extremely difficult to revise a program without knowing what the writers of the program tried to accomplish. Unfortunately, old-style programming methods left very little trace of what the writers intended, either in the program itself or in its documentation. It is conceivable that the best way to revise most of the SSA application programs is to study the legislation that they are intended to implement and to rewrite the programs de novo.

On the other hand, equally hard-bought experience teaches that it is no minor matter to prepare, from scratch, a large system of application programs, especially if they have to deal with complicated patterns of exceptions and precedents. The creation of software programs directly from legislation is only in its infancy. While interesting research on this subject is being done at the London School of Economics, not enough progress has been made to provide a methodology for turning the social security legislation directly into software. Perhaps some advantage can gained from the technique called "Production Rule Systems," in the field of artificial intelligence, to structure the SSA procedures in terms of conditions that could exist in a particular case, and the actions that should be taken when the conditions exist.

It is likely that SSA programs in the future process will be shorter and simpler than those of the present one. The panel has worked with the SSA staff to estimate the level of simplicity/complexity of the SSA process, but it has not been possible to draw firm conclusions. During the past few months, the panel has moved toward adopting the simplicity hypothesis--namely, that individual processes can be self-contained, with few if any interfaces with any others. The subpanel that studied the SSA's transition planning estimates that reprogramming de novo could cut the amount of "code" (measured in terms of numbers of machine instructions) by 70 to 80 percent. The amount of code that has been generated is currently estimated to be 12 million machine instructions. If this amount of code could be reduced to 1 million machine instructions, based on 100,000 source level statements in a high level language, almost everyone would certainly favor reprogramming from scratch.

From the point of view of software development, the fact that there are some 200,000,000 individual accounts in the overall SSA data base poses a challenge, although not an insurmountable one. The records of different clients do not often interact. Indeed, the only significant interactions are limited to the records of the members of the same family, and rarely do more than three or four records have to be examined together. Of course, computer programs are just as capable of dealing

successively with 200 million records as with 200. The quantity of data primarily affects the data base, rather than the application programs, and even in the case of the data base, the quantity affects size rather than complexity or intricacy.

It is somewhat intimidating to see the many, many pages of client information that fill thick file folders on desks and in racks at the Program Service Centers. After looking at a "worst case" file folder, one can imagine that the corresponding data structure in a computer would probably be a tree or network of some kind, full of pointers, data groups, and data elements, and it would be very large and complex. But the complexity of the worst cases need not be the measure of difficulty of creating applications to deal with normal transactions. The typical case is much less complex than the worst case. Records of typical clients seem to be fairly simple and manageable.

Until there is a formal data dictionary, with definitions of all the data elements that make up the SSA data base, it will be difficult to determine just how many data elements are essential or frequently encountered. For example, the client's home address might be a single data element, or might be broken down into street address, city, state, and ZIP code, or the street address might be broken down into street number, street name, and street type. Conversely, annual income, which appears to be only one item when considered in the aggregate, may turn out to be ten or twenty or even fifty items when taken year by year over the client's life. Such differences explain why estimates of the number of data elements in a typical client's record have varied from about a hundred to a few thousand. Even so, all the estimates appear to fall within the capability range of modern data management technology.

CONVERSION OF THE DATA BASE

Although application programs for the future process can be created either by modifying existing application programs or by writing new ones, the data base for the future process can be assembled only by the conversion of the several existing files. It is not clear how much the present data bases need to be "cleaned up" by the SSA before being be turned over to a contractor for conversion to the future data base, either for a competitive demonstration or for the transition. Both the magnitude and cost to establish and maintain an upgraded data base compatible with existing application programs are unknown, but an attempt should be made to assess the effort and cost. This would appear to require the full cooperation of an SSA staff organized to reflect the several existing data bases and application programs.

Because the condition of the data base to be turned over to the contractors represents for them an important baseline, the essential characteristics of the data must be established by the SSA at an early date. The data elements that will be furnished to the contractor (and that will be in concurrent use in the present process before transition) should be clearly defined and standardized across all SSA programs. Such definitions of data elements could be established by a task force made up of both short-term and long-term planners. The definitions could be the interface from which OAS and the contractors could plan

and toward which SSA redesign efforts now in progress could proceed. It is important to note that the panel has been discussing only the definition of data elements, not data base structure or storage media, which are matters to be decided during the acquisition process.

The panel considers it important for the SSA to establish at the outset the relationships between data elements, even though the sequence of steps in conversion/integration of the data base will necessarily depend on the approach taken to transition. In the horizontal slice approach based on services, the enumeration data base would be brought up first. Not at all representative of the central body of the future process, it is a very special data base, different from all the others, and, in a sense, an index to them. In the vertical slice approach based on locations, it would be necessary to establish control over all the different data elements, but it would not be necessary initially to convert all the data. It would suffice to convert only the data pertinent to the one or several local offices. In the vertical slice based on subsystems, it would be necessary to convert and integrate the entire SSA data base. Attacking the whole data base at once would focus attention upon the requirement for special facilities to resolve the conflicts that are bound to arise when corresponding but perhaps contradictory parts of the present unintegrated data base are brought together and unified.

It seems unavoidable that both the existing and the new versions of the data base will exist concurrently for at least some interval during the transition. It would be natural to build the new data base progressively, record by record. It will be necessary to have an index or directory that will provide a quick response to the query, "Where is account (SSN) xxx-xx-xxxx ?" When there are new as well as old application programs, the new ones could use data retrieved from the new data base, and the old ones could process the old-style tapes as they are doing now. Before new application programs are ready, there must be a way to return the new data base to the old formats. It may even be necessary to write old-style tapes from the new data base.

The problem of keeping the two versions in agreement appears formidable. Accordingly, the panel has considered two approaches.

- The old data base could be maintained as the total and definitive data base until the new one is fully prepared. In this case, the basic updating should be carried out on the old data base, so it would always be current. Whenever a record is updated that is also in the new data base, it must be updated in both the new data base and the old one. Obviously, maintaining an updated new data base requires extra work, but this approach is essentially conservative. The old data base is always available, and, therefore, the information and organization cannot get worse than they were before the transition began.

- The new data base could be definitive for records it contains, while the old data base could be definitive only for records not in the new data base. But if there

are requirements for a complete data base in one uniform format, the old data base should be updated--with respect to records contained in the new one--from the new one on a batch basis. While it would be desirable not to use the old data base for new data base records in intervals between updatings, it could be used for management information purposes, where errors of a fraction of a percent would not be disastrous.

Mass storage devices open up interesting technical possibilities with promise of reducing the overall cost of storage. Although the cost of mass storage devices may not be decreasing as rapidly as the cost of disk files, their cost advantage is still a factor of five or ten, which may be very important during the transition, if it proves necessary to operate two data bases concurrently for a long period. The pace of data base conversion might be greatly accelerated by the transfer of the most-frequently-used of the present tapes into mass storage. From there, a data conversion facility could process them readily and translate their contents from old-style formats to new. There are many other possible approaches, of course, and the SSA has a contractor exploring several of them.

CRITERIA FOR EVALUATING TRANSITION PLANS

Whether the SSA itself will pick a specific transition sequence, or whether transition planning will be one of the topics dealt with competitively by the contractors during the competitive detailed design phase, it is important to develop criteria for the evaluation of transition plans. The main criteria discussed by the panel are the following:

Service-Related Criteria:

- Continuity of operation through every stage of transition
- Avoidance of service disruption
- Avoidance of transition-induced errors
- Achievement of significant and visible improvement in service at an early date
- Provision for capturing, in the basic design of the system, management information on quality of service and on productivity

Cost-Related Criteria:

- Minimal concurrent operation of old and new systems
- Minimal non-productive investment

- Minimal transition bulge in personnel
- Minimal transition bulge in overall operations cost
- Achievement of significant improvement in cost-effectiveness at an early date

Personnel-Related Criteria:

- Maximal use of existing SSA people and skills
- Minimal work force apprehension and disruption
- Distribution of demand on SSA and contractor expertise uniformly over time
- Early identification, definition, and resolution of problems of concern to employees and clients

Security and Privacy Related Criteria:

- No hiatus in security control during any interval of the transition
- Incorporation of security and privacy protection features into the basic design of the new system
- Incorporation of authentication procedures and audit trails into the new system

These criteria are obviously not independent of one another. It will be necessary to give ground on some to achieve others. The SSA will have to establish the relative priorities and trade-offs between the criteria.

Several trade-offs seem especially significant in the panel's review. The criterion of minimal non-productive investment would not be met if a large fraction of the total work of creating the new process were applied to only a small part of the SSA--and thus failing for a period of time to achieve full return on the investment. Still, this consideration must be weighed against other criteria that call for the avoidance of disruption and transition-induced errors. The criterion of minimal concurrent operation of the new and old systems is based on two considerations: it will be expensive to operate the two systems concurrently, and it will be difficult to keep them in agreement during any necessary period of concurrent operation. Nevertheless, it would be highly undesirable indeed to make an irrevocable transition to the new process before it is debugged and made stable. Finally, early identification, definition, and resolution of problems of concern to employees and clients are easy to enunciate but difficult to reduce to a program of specific actions. The panel concludes that the SSA should have a positive program to identify the skills required by the new

process, to conduct training necessary to achieve those skills, to deal effectively with concerns about transfers and job security, and to bring the practical knowledge of the present process that is in the minds of so many SSA employees to bear upon the design of the future process. Considerations of human factors are amplified in Chapter VI.

CONCLUSIONS AND RECOMMENDATIONS

Even after a year of study and deliberation, the panel's conclusions about transition are by no means sharply defined, but some of the work required to reach conclusions has been identified.

First, it is essential that the size and complexity of the data base be understood more clearly. In particular, it is necessary to define the data structures and, especially, the basic data elements. The SSA has two significant activities in progress that are designed to clarify the state of its data. The Office of Advanced Systems has plans to have a contractor study this problem, and the Office of Systems, in its Retirement, Survivors, Health, and Disability Insurance (RSHDI) Redesign Project, has been in the process of simplifying existing batch job streams. Each of these projects requires that the basic data elements that make up a client's record be determined and defined. Accordingly, the panel recommends that a task force be created to enumerate and to define the basic data elements, to study the patterns of interrelation among the data elements, and where possible, to define data groups or structures as well as elements. Another question such a task force might examine is whether the future data base should be organized along the lines of a hierarchy, a network, or--in the parlance of relational data bases--a system of relations.

Second, it is essential to understand the application programs in approximately the same way as it is essential to understand the data elements. Just as with the data, understanding begins with definition. It is not possible to say how many application programs there are until what is meant by a program has been clearly defined. The widespread impression is that there are many application programs, and that the structures of the data are built into the application programs--rather than into a data management system. In the RHSDI Redesign Project, the data are being brought under the control of a data management system, and application program segments that deal with data structures and data addresses are being separated from the segments that actually process data. The panel sees the need for a survey of the application programs that will yield an understanding of their classes, their sizes, their structures, and their complexity of organization--that is, where they stand on a scale running from simple, direct, and straightforward to complicated, baroque, and bizarre. It is important, also, to identify the programming languages in which they are written and the actual degree of machine independence. Therefore, the panel recommends that a joint project be undertaken to clarify the present state of the application programs, especially in the light of integrated data base concepts.

Third, there is the problem of how to bring to bear upon the planning of the future process and the design of the future system the knowledge that is in the minds of SSA people in the district and branch

offices. The thrust of OMB Circular A-109 puts a large amount of initiative and responsibility into the hands of contractors, and it is clear that during the initial phases of the work there will be a number of contractors. Their initiative, creativity, and knowledge of computer-communications technology will need to be complemented by an understanding of the actualities of the SSA process. The contractors will need to learn many of the things the SSA personnel know. The problem is how to transfer such knowledge. To some extent, it may be possible to partition the problem by having the contractor work on the future system "from terminal to terminal" and to leave to the SSA itself the responsibility for defining all the aspects of the future process that will affect the procedures and patterns of work. But interactions across the terminals, across the interfaces between the two areas of expertise will surely be very strong. The contractors will, in fact, have to understand the procedures and patterns of work and the attitudes and skills of the SSA people. Even though this problem is well understood by the planners in SSA, and they are working on it, the panel recommends that it be given continued and even increased attention. This problem should be considered carefully, also, by the officials concerned with the development of A-109 policy, because the effort to take full advantage of the creativity of contractors intensifies the need to transfer to the contractors knowledge of the work procedures and processes employed by the agencies of government.

Fourth, closely related to what has just been discussed, there is the problem of foreseeing the concerns of the work force as it moves from the old process to the new one. This problem is critical because the time constants are long. During the past year, personnel from local offices and program service centers have worked with the planners in OAS and with this panel, giving it a direct appreciation of the contributions they can make. The panel therefore recommends expansion and intensification of the effort to bring into the activities of planning, design, and evaluation, the SSA people who interact directly with clients.

Finally, the new process will have to be tested. No doubt a major test will be its acceptability to the SSA personnel who are thoroughly familiar with the present process and expect the future process to be faster and more efficient than the present one and at least as effective. Nevertheless, the panel considers it desirable to put the new process through a series of formal tests. The planning of such tests has been undertaken, but not enough progress has yet been made to lead to conclusions.

TRANSITION GUIDELINES

During the panel's study of transition, several guidelines were examined and found to be of basic value despite being relatively obvious. The panel lists them here as considerations that should be taken into account during the planning for transition:

- Modularize the transition as if it were a system.
- As part of the modularization, divide the transition into steps, with the ability to stop the transition and operate successfully after any step.

- Consolidate after each step to avoid an accumulation of bugs.
- Take no irrevocable step.
- Achieve visible successes early; avoid early conspicuous failures.
- Make it clear to all observers that, because of the magnitude and difficulty of the undertaking, some temporary setbacks can be expected.
- Choose an initial module that is representative of the overall task of designing and implementing the future process.
- Emphasize contributions, involvement, and acceptance by the SSA people who will use the new system.
- Test human factors innovations in the Test and Evaluation Facility and then in actual operating situations before adopting them throughout the system.
- Build privacy and security provisions into both the transition and the future process; and guard against the creation of future vulnerabilities by the "Trojan Horse" method during transition.
- Minimize the duration of continued vulnerability to a single-site disaster.
- Harmonize the upgrading of the present process with the transition to the future process.

CHAPTER V

Privacy and Security

In its first report the panel emphasised the importance of privacy, security, and confidentiality for the millions of records of personal information that the SSA maintains, and it concluded:

> Respect for the right of clients to confidentiality and security of information needs to be assured in the basic architecture and design of the future SSA process. There is no way to achieve an acceptable level of privacy and security by adding features or techniques after the design is completed.

Privacy, security, and confidentiality are closely related concerns that can be generally distinguishable as follows:

- Privacy--the protection afforded personal information to prevent injury or humiliation of individuals from its misuse or improper dissemination.

- Security--the protection of systems and information against damage, unauthorized divulgence, or denial of use by rightful owners.

- Confidentiality--the protection of sensitive information against access without proper authorization.

Thus, confidentiality characterizes the need for limitation of access to certain information, whereas computer security represents the physical, technical, and administrative means for providing protection and for controlling access. Informational privacy is a set of legislatively-based procedures that govern how personal information may be used.

The panel has observed in this review that the Office of Advanced Systems (OAS) has increased its emphasis on these matters significantly. Among other actions, the SSA has issued a good soliciation for technical support that has led to the selection of a support contractor well-versed and experienced in the field. Under the terms of the contract, a system-wide examination is being conducted that should lead to recommendations for a series of privacy/security/confidentiality controls at appropriate

points throughout the future system. The panel concludes that beyond this important effort:

- The SSA should make its own judgment of the threats that the future system will face--e.g. physical destruction, electronic eavesdropping, employee fraud, unauthorized divulgence of information, willful modification of file entries, disruptive attacks, communications outages, machine malfunctions, and system malfunctions resulting from software errors. It should analyze the federal legislation and executive guidelines under which the future system will have to function, particularly the Privacy Act of 1974, the Freedom of Information Act amendments of 1974, and OMB Circular A-71 on Security of Federal Automated Information Systems, issued July 27, 1978.

- The SSA should then take into account the safeguards recommended by the contractor, enunciate a clear policy on access to and safeguarding of information, arrive at firm requirements for privacy/security/confidentiality controls, and incorporate such controls into its system requirements.

- The SSA should incorporate into its plans appropriate provision for a monitoring activity to ensure that RFPs reflect a determination about which controls and safeguards are considered essential, that proposals received in response to the design RFP are, in fact, responsive to privacy/security/confidentiality considerations, that the selected vendors implement effective controls, and that such controls are tested adequately throughout the system.

Subsequently, the SSA will have several tasks, including

- Educating employees throughout the system about the concepts and techniques of security, privacy, and confidentiality.

- Training employees to ensure that the controls incorporated in the system design will be used properly.

- Creating a system security office to monitor the functioning of controls and safeguards throughout the system, to be the focal point for privacy/security/ confidentiality matters both in policy and in daily operation of the system, to oversee the entire system from the privacy/security/confidentiality point of view, and to simulate penetrations of the system to test the efficacy and appropriateness of controls.

In seeking approval of its plans by internal and external reviewing officials and agencies, the SSA needs to be prepared to provide the rationale and the details of its program to ensure privacy, security, and confidentiality, because these three topics are of such fundamental and now widely recognized importance.

CHAPTER VI

Human Factors

In its earlier report, the panel concluded that

> Consideration of human factors in the future process is vital because millions of individuals depend on the services of the SSA to assure their welfare. Because nearly everyone is involved with the social security system in one way or another, its disruption needs to be avoided. It is central to the concept, therefore, that human factors be in the mainstream of the system development.

Human factors comprise the behavioral components of work systems. Although important in all work systems, human factors achieve particular significance in systems that are labor intensive, or whose product is a human service. In an organization such as SSA, which delivers a human service through a labor-intensive work system, human factors are a major determinant of performance.

Human beings, unlike simple machines, are capable of exceeding their "design potential." An SSA claim representative making a determined effort to unravel a complicated claim for the benefit of a retiree exemplifies the latent possibilities of human behavior. Observing this phenomenon among government employees in 1937, Luther Gulick wrote:

> Their capacity for great and productive labor, creative cooperative work, and loyal self-sacrifice knows no limits provided the whole man, body-mind-and-spirit, is thrown into the program.4/

By contrast, human performance can also be self-limiting. Human beings are quite capable of restricting their productivity for reasons or motives that may in fact be totally unrelated to the work system.

How effective the SSA's future process will be depends upon the skill with which the SSA addresses and resolves human factors issues. While the capabilities and expense of modern data processing and telecommunications facilities might distract attention from human factors issues, the success or failure of the future process will turn on human factors. If a claims representative working with a client in

a local office cannot or will not "make it happen," the future process will fail to achieve its potential for cost-effective service.

Human factors considerations cut across all the key system concerns already discussed--acquisition, transition, and privacy and security. Human factors is not simply another component in a chain of components in the future process, or any other work system. Rather, it is an integral and essential aspect of all of the constituents of the system.

Measured in isolation, human factors might appear to contribute little to the accomplishment of system objectives. In the statistical sense, human factors are "interactive" rather than "main effect" variables, and by interacting with other system factors, human factors account for a great proportion of the variance of a system's performance. It is this interactive aspect that makes human factors so critical and at the same time so elusive.

The SSA, in its human factors studies, is thoroughly evaluating the interface between the SSA employee and the proposed new system. Its evaluation includes considerations of the configuration of the termainal --one of the main interfaces between the human and the electronic data processing system--and changes in office procedures.

The interface between a person interacting with a system and the system itself should be designed so that people feel comfortable with the system and are willing to work with it and utilize its features. Even though a system may be rich with features, the people interfacing with it may avoid using them because they are difficult to learn or remember, they require unnatural motions, input mechanisms are confusing, output responses are difficult to recognize or resolve, distracting sounds or lights emamate from the interacting device, colors or shapes are confusing or repugnant, or other factors engender an antagonistic attitude toward the new system. Furthermore, distrust can develop because established relationships with an old system have been disturbed.

Human factors design contributes to the overall effectiveness of a system, primarily by ensuring that people interface efficiently with it and with one another. The form of interaction with the system should not become a barrier to such human interactions as those between a claims representative and a client.

Issues that require analysis include: what impact computer terminals might have on the relationship between claims representative and client, whether it is useful or desirable to let the client view the terminal's screen, and whether in certain simple applications, clients would like to, or be willing to, operate terminals themselves in lieu of waiting.

THE NEEDS OF CLIENTS

An area that requires further attention is the evaluation of needs of the SSA clients. The SSA provids a service mandated by legislation, but the manner in which the SSA meets the perceived needs of clients may determine if or how well they are satisfied with the service. It is desirable that the future process satisfy the perceived high-value needs of all clients.

The SSA could, through an experienced consumer research organization, determine which aspects of the SSA service delivery system are considered most important by clients. To complement the SSA's present human factors studies and to provide significant insight to service attributes that should be stressed, the panel suggests that the SSA pursue a study of clients' attitudes about the process. In recommending this, the panel observes that great care is required in the planning, execution, and interpretation of such a study.

HUMAN FACTORS IN ACQUISITION

As described in Chapter III of this report, the Social Security Administration is governed in its acquisition of a large computer-communications system by the policies of OMB Circular A-109 and the Brooks Act. Thus, the SSA needs to adopt an acquisition strategy that gives vendors a chance to respond with maximum design flexibility, while making sure that the critical human factors issues are fully considered. Highly detailed human factors requirements might be viewed by some as unnecessary constraints on vendors in their development of designs for the future system. Yet, without full considerations of behavioral factors, the acquisition might be driven entirely by technological considerations. An approach to this problem was suggested earlier in the planning effort by the Office of Advanced Systems in its summary of the human factors program:

> In order to integrate technology into the user's job, it becomes necessary to thoroughly understand all of the activities that must be performed within the job position; the ways in which they relate to each other; and the inputs and outputs of each activity. Once a complete understanding has been reached, it becomes possible to make a rational allocation of functions between employee and computer.5/

To develop the understanding delineated in the first sentence of the OAS excerpt above is clearly the responsibility of the SSA. The allocation described in the second sentence is a task for potential vendors responding to the RFP. The problem is how to convey SSA's understanding to the vendors.

The panel finds that it would be entirely appropriate for the SSA to include in its RFP functional service output requirements and criteria, but inappropriate and undesirable to include structural constraints on hardware, software, or design. The SSA should provide detailed descriptions of the client service interactions required of the social security system (the basic source of which is statutory) and detailed criteria that it will use to judge the cost-effectiveness of the services delivered. To give full recognition to human factors, the SSA could request vendors to demonstrate, first through simulations, and then in district offices, the features of their service delivery systems.

The strong commitment of SSA's Office of Advanced Systems to human factors is indicated by its establishment of a Human Factors Test and

Evaluation Facility (TEF). This facility acts as a laboratory to test many of the facets of human factors. The panel notes, however, that because the human factors problems related to the future process cannot all be studied in a laboratory facility, the OAS plans for the coming year call for some human factors tests to be made in operational field offices. The essential point is that employee and client attitudes and perceptions not readily captured in a laboratory may be critical to the success of the future process. The SSA will need to deal effectively with them, as well as with the more tractable "human engineering" problems. Just as much of the human factors work will take place outside the TEF, the TEF can also be useful for purposes other than human factors. The panel is impressed with the personnel and activities of the TEF, and considers that it has the potential to play a major role not only in human factors, but in the acquisition and transition processes as well. Both planning and operating personnel can use the TEF to collaborate on the development and documentation of service interaction requirements and evaluation criteria in an effort to ensure that acquisition decisions are made only after full consideration of human factors. Working prototypes of alternative district office subsystems can be demonstrated in the TEF without disrupting actual operations in a local office and without subjecting contractors to unpredictable and uncontrollable factors. The panel supports SSA's plans to exploit the TEF in this way.

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APPENDIX

TEMPORARY FEDERAL PROCUREMENT REGULATION 47

TO: Heads of Federal agencies

SUBJECT: Major system acquisitions for automatic data processing (ADP) and telecommunications.

1. Purpose: This FPR temporary regulation clarifies the relationship between Office of Management and Budget (OMB) Circular No. 109, Major System Acquisitions, the Federal Procurement Regulations (FPR), and the Federal Property Management Regulations (FPMR) governing major ADP/telecommunications system procurements. The temporary regulation also provides interim policies and procedures concerning such acquisitions.

2. Effective date: This regulation is effective October 16, 1978, but may be observed earlier.

3. Expiration date. This regulation will continue in effect until canceled.

4. Background:
a. The Commission on Government Procurement studied the Government's major system acquisition practices and recommended basic changes to promote economy, efficiency, and effectiveness in the management of the major system acquisition process. OMB Circular A-109 which implements these recommendations, was issued April 5, 1976. This OMB Circular establishes specific policy and procedural requirements for implementation by executive branch agencies. Basically, the Circular provides for:

(1) Top level management attention to the determination of mission needs and goals;
(2) An integrated systematic approach for establishing mission needs, and for budgeting, contracting, and managing programs;
(3) Improved opportunities for innovative private sector contributions to national needs; and

(4) Early communication with the Congress and OMB in the acquisition process by relating major system acquisitions to agency mission needs and goals. OMB Circular A-10 relating to budget estimates establishes requirements that should be followed in the communication to the Congress. OMB Circular A-11 relating to ADP and telecommunication requirements establishes requirements that should be followed in the preparation and submission of budget estimates to OMB.

b. The decision whether ADP and/or telecommunications major systems are required is the responsibility of the using agency. Under OMB Circular A-109 the using agency head establishes dollar thresholds for the determination of which agency programs are to be considered major system acquisitions for that agency.

c. The fact that the acquisitions of major systems are made in accordance with OMB Circular A-109 does not alleviate the need for compliance with the applicable provisions of the FPR and/or FPMR. Accordingly, this temporary regulation describes the responsibilities of the using agency after the agency's decision is made to acquire under the A-109 policies. In addition, this temporary regulation describes the responsibilities of the General Services Administration (GSA) when GSA procures the major ADP or telecommunication system for the using agency or delegates the authority to the using agency to conduct the procurement.

d. In August 1976, the Office of Federal Procurement Policy (OFPP) published pamphlet No. 1, titled "Major System Acquisitions, A Discussion of the Application of OMB Circular No. 109". An OFPP pamphlet setting forth the application of A-109 policies to the acquisition of major ADP and telecommunications systems is being developed by GSA and OFPP. The new pamphlet will supplement the provisions of this temporary regulation.

5. Policy: The major system acquisition procedures described in OMB Circular A-109 are designed to maximize competition and encourage innovative solutions to agency mission needs. Accordingly, major ADP and/or telecommunications systems shall be acquired in accordance with this regulation, other applicable provisions of the FPR and/or FPMR, the OFPP pamphlet and agency A-109 implementing procedures to meet agency mission requirements.

6. Agency action:

a. Using agency responsibilities prior to the contracting phases of the acquisition.

(1) The using agency shall perform an analysis of mission needs. However, the advice and assistance of GSA may be requested in performing the analysis, particularly in regard to contemporary experience which may be

applicable to the agency need. Requests for assistance should be addressed to the General Services Administration, Agency Services Division (CDS), Washington, D. C. 20405.

(2) The agency shall advise GSA upon agency head approval of the mission need statement (Key Decision I) and of the assignment of the program manager when major ADP/telecommunications equipment or services (systems) are to be acquired in accordance with A-109.

(3) The agency is responsible for the development of the system acquisition strategy and plan. However, since this plan will become the blueprint for the procurement, it should be developed in coordination with GSA. Participation by GSA may be arranged by contacting the Agency Service Division.

(4) The agency program manager shall forward the approved major system procurement request to GSA (CDS). The request shall include applicable data required in the agency procurement request (APR) as required by FPR # 1-4.1104 or the GSA Form 2068. Request for ADP Service as required by FPMR #101-36.203-2. In addition, the request should include:
   (a) The user mission need statement, approved in accordance with applicable directives (Key Decision I--Approval of Need);
   (b) The name and telephone number of the designated program manager together with the approved charter outlining the manager's responsibilities, authority, and accountability; and
   (c) The system acquisition strategy and plan, approved by the program manager.

b. GSA responsibilities prior to the contracting phases of the acquisition.

(1) GSA will advise the agency, as requested, in their mission analysis efforts to the maximum practicable extent.

(2) GSA will participate, in an advisory role to the using agency program manager, in the development of the system acquisition strategy and plan, upon request.

(3) Based on the major system procurement request, GSA will:
   (a) Delegate authority to the using agency to conduct the procurement;
   (b) Delegate authority to the using agency to conduct the procurement action subject to GSA participation to the extent specified in the delegation; or
   (c) Conduct the procurement on behalf of the using agency.

c. Contracting under A-109 procedures. When A-109 policies are applicable, normally only one solicitation at the beginning of the

exploration of alternative system design concepts will be used. The scope and basis for selection of the solicitation may, however, vary depending on the complexity of the mission need and the acquisition strategy. For example, in complex situations the solicitation may request proposals which describe the contractor's capabilities, understanding of the mission need, approach to developing a system design concept to meet the need, and identify the personnel which would be assigned to the contract; or in less complex situations the solicitation may request proposals which define the contractor's recommended system design concept. In either situation, the evaluation of the proposals will result in the selection of two or more contractors to develop or further define recommended system design concepts. When evaluation of the contracted efforts shows sufficient definition of concepts, program manager recommendations will go forward for using agency head Key Decision II, Approval of concepts for Demonstration, or Key Decision III, Approval of Full Implementation. If a demonstration of concept phase is approved, two or more of the remaining contractors in the competition will be selected to verify their concepts and design. Evaluation and selection of the final contractor will be based on this phase. However, it does not necessarily follow that the system contractor would be responsible for all aspects of the full implementation. For example, the Government could acquire ADPE and software in accordance with the system contractor's performance specifications and furnish it to the contractor for incorporation into his system implementation. The using agency head Key Decision IV--Approval for Production, will apply in the case where a multiple quantity of systems are required to meet the agency need.

d. Using agency responsibilities when GSA delegates contracting action to the using agency. When the agency is acting under a delegation of procurement authority pursuant to paragraphs 6b(3)(a) or (b) of this temporary regulation, the agency shall conduct the procurement in compliance with applicable procurement policies, regulations, and, in particular, the specific terms of the delegation.

e. Using agency responsibilities when GSA procures for the using agency.

(1) When GSA elects to conduct the procurement under paragraph 6b(3)(c) of this temporary regulation, the procurement is a joint endeavor. Agency responsibilities shall be as set forth in FPR #1-4.1105-1, as modified and supplemented in this subparagraph 6e.
(2) The agency shall submit its determination and findings to support the authorization to procure by negotiation.
(3) With reference to paragraph (b) of #1-4.11-5-1, the technical portion of the soliciation document should cover the statement of work, the functional specification addressing the mission need statement, limitations and constraints, environment, facilities, and

work force, urgency and priorities, transitioning, changes, growth potential, and other requirements that must be met by the offerors. Other information that the offerors need in order to properly construct their proposal shall be provided. The solicitation should outline the overall acquisition strategy, the specific evaluation criteria for the initial contracting phase, and criteria for follow-on phases. If the initial contracts will be for system design concepts, the technical, judgmental, and total cost criteria to be used in the evaluation of alternative system design concepts should be provided to assist offerors in preparing the the subsequent phases of the acquisition.

(4) The agency shall provide for the necessary personnel for evaluation of the concept designs and demonstration contracts and for the selection of alternatives for further consideration.

(5) The agency shall provide copies of agency head approvals (Key Decisions).

f. GSA responsibilities when GSA procures for the using agency.

(1) When conducting the procurement, GSA's responsibilities will be as set forth in FPR #1-4.11-5-2, as modified and supplemented in this subparagraph 6f.

(2) When evaluation criteria includes technical considerations (or points), GSA will insure that the evaluations criteria for selecting the succcessful offeror from the final acceptable alternatives will result in meeting the using agency's need at the lowest ultimate overall cost, price and other factors considered.

7. Effect on other issuances. Notwithstanding any limitations of applicability of the FPR or the FPMR, the provisions referenced in this temporary regulation apply to all ADP and telecommunications major system acquisitions by executive branch agencies subject to the provisions of OMB Circular No. A-109.

8. Solicitation of comments. Notwithstanding the provisions of this temporary regulation, the views of agencies and other interested parties are invited regarding the policy and procedures that should be adopted in the future. All comments received on or before December 13, 1978, will be considered.

JAY SOLOMON,
Administrator
General Services

September 12, 1978

Glossary

ADP--automatic data processing.

Application Program--a computer program that is organized and written in terms of a specific end use or direct application of the computer system--as distinguished from a system program that augments or extends the general capabilities of the computer system and as distinguished from a utility program that provides a specific capability that is likely to be useful in many different applications.

Architecture (of an information system)--in analogy with the architecture of a building, the organization or configuration of the system in terms of its main subsystems and components. "Architecture" usually implies relationships that are structured, but sometimes the term is used to refer to relationships that are primarily functional.

Batch Processing--the periodic processing of data that has accumulated over a period of time as distinguished from real-time processing where individual transactions are presented for processing as they occur.

Branch Office--a local SSA office subordinate to a district office, often open only part-time.

Central Processing Unit (CPU)--the section of a computer system that performs logical, arithmetic, and control operations. A CPU also performs some storage functions, but as the term is used today, it does not include the main memory/storage parts of the computer system.

Claims System--the application subsystem that determines claims entitlement for clients of the Social Security Administration system.

Communications Network--a collection of communications channels, switching centers, control devices, and other equipment that collectively comprises a communications capability interconnecting a number of locations.

Confidentiality--the status accorded to sensitive information that characterizes a need to limit access to it without proper authorization.

Current Process--the total process, hardware-software-human activity and procedures, through which the Social Security Administration currently delivers its services.

Data Base--an organized collection of information available to one or more processing systems or to users for referencing purposes. See Record.

Data Processing (by computer)--the application of computer systems and storage media to the management and manipulation of data, as distinguished from computer applications devoted to scientific computations, interactive communications, or process control.

Disk Storage--a direct access storage device that can store from a few million up to several hundred million (eight-bit) bytes of data. Information is stored magnetically on one or more rotating disks.

Distributed Processing--a method of processing that uses a number of interconnected computers, separated geographically.

District Office--a full-time local SSA office where the public can obtain information about Social Security benefits and file claims.

Earnings System--the application subsystem that manages the recordkeeping related to earnings.

Enumeration System--the application subsystem that assigns Social Security Numbers and keeps track of them.

File--a series of units of information that are structurally similar to one another. File implies succession. See Record.

Future Process--the total process--hardware, software, human activity and procedures--through which the SSA could deliver services from the mid-80's through the end of the century.

Hardware--the physical equipment used in computer and/or communications systems. The computer, terminal devices, modems, and data communications circuits are considered hardware, as differentiated from software, which consists of programs and data that apply hardware to a function or task.

Hierarchy--a structured array of information, categories, people, systems or other items, with graded relationships among the items. A hierarchy can usually be represented by a branching tree (or root) diagram.

Horizontal Slice--a transition plan in which the several SSA services would be converted one at a time to the new process and then implemented individually throughout the SSA.

Human Factors--the behavioral components of a work system, in this case, the SSA process. "Human factors" is used (in a plural sense) to refer to the factors relating to human performance, and (in a singular sense) to the field of study that stresses such considerations.

Integrated Data Base (for SSA)--a single, unified data base containing the data necessary for all SSA processes (as distinguished from the present multiple files, each organized for a separate application).

Interactive--a category of computer applications characterized by communication between a user and a computer program, with which the user interacts. The cycle time for the interaction is usually a few seconds or less.

Magnetic Tape--an information storage medium that utilizes thin strips of plastic coated with a magnetic material. A tape is typically 2400 feet long and half an inch or an inch wide. Information is stored on it, typically, in rows of bits, usually eight bits (one byte) per row, with a few hundred to a few thousand bytes stored per inch along the length of the tape.

Mass Storage--the storage of a very large amount of data in a single storage device, readily accessible to a central processing unit. Typical mass stores can hold from 50 billion to 5 trillion bits.

Management Information System (MIS)--a system intended to provide information to the management of an organization to support planning, decision making, evaluation and monitoring, of operations. A modern MIS in a geographically distributed organization includes computer and telecommunication functions that are carefully interfaced with operational computer and telecommunications systems.

Modeling (computer-based)--representing, in the form of computer programs and data, an abstraction of a system, organization, or process. The behavior of the representation as it runs in a computer can be studied to gain an understanding of, or to test hypotheses about, the system, organization, or process it represents. "Modeling" and "simulation" are often used as synonyms; when a distinction is made, "modeling" is usually made the broader, more general term and is used to include, for example, closed-form mathematical representation, whereas simulation is restricted to the subset of models in which, to a fairly low level of detail, parts of the model correspond directly to parts of the thing modeled.

OAS--the Office of Advanced Systems. The organization within the Social Security Administration responsible for planning a future SSA process.

On-Line--pertaining to peripheral equipment under direct control of, or in communication with the central processing unit of a computer system; or pertaining to a user's ability to interact with a computer. See Real-Time.

Packet Switching--a communications technique by which information is transmitted from source to destination as addressable packets of both data and control elements, through a network of high speed switches.

Partitioning--the subdivision or segmentation of a system. process, or collection of information, usually to simplify development, management, operation, or maintenance.

Post-Entitlement System--the application subsystem that processes information affecting the continuing entitlement of clients already authorized to receive benefits, and the amount of benefit payments to them.

Privacy--(in this context) the principles that underlie the Privacy Act of 1974, including such principles as: that there are limits to the types of information that an organization may collect about an individual, and limits on the internal uses and external disclosure of that information; that individuals have a right to see and copy information maintained about themselves, and to correct and amend it; and that agencies of the federal government must not be secretive about their personal-data record-keeping policies, practices, and systems.

Production Rule Systems--a software s, stem in which the program is essentially a list of condition-action pairs or if-then pairs. In the simplest such system, the computer tests the condition part of the first pair and, if it is satisfied (true) carries out the corresponding action and then goes back to the starting point for another cycle. If the first condition is not satisfied (false), the computer goes to the second pair, tests its condition, and, if it is true, carries out the corresponding action and then goes back to the start. If the second condition is false, the computer goes to the third pair, and so on. In most production rule systems, most of the conditions and actions are complex.

Program Service Center--a major SSA office that reviews the more complex claims, that certifies the correctness of continuous payments, and acts as the repository for claims folders.

Real-Time--the actual time during which a physical process (external, to a computer system) is active. Also, the natural rate of flow of time, so that "real time" can be distinguished from "fast time" (as in a speeded-up motion picture) and "slow time" (as in time-lapse photography). A real-time computer system is one that is capable of communicating with an external process without delaying that process. If the users of an interactive computer system are viewed as "external processes," and if the system supports them in their work without delaying them, the interactive system may be said to be a real-time system, but usually "real-time" is used in referring to computer systems that monitor and/or control physical or chemical, industrial or military processes.

Record--a grouping or structuring of information, usually consisting of several elementary items or subordinate groups. Typically, all the information in a record is about a single individual, a single entity. If there are many entities, all of the same type, typically their records are stored in a sequence and referred to as a "file." Thus "record" refers to one or more intermediate levels in a hierarchy that includes "data base" at or near the top, "file" at a high level, then "record" (or sometimes "structure"), and "item", "field", or "element" at or near the bottom.

Response Time--the time that elapses between giving a command to a computer system and receiving a response from it. Response time will vary depending on the transmission times, processing time, access time to obtain files, and time lost waiting for competing tasks to be accomplished.

RFP (Request for Proposal)--a solicitation for bids to perform work, in this case, the development and implementation of the future process.

RSHDI Redesign--the Retirement, Survivors, Health, and Disability Insurance Redesign Project, a project to make improvements in the current SSA data processing system.

Security--the protection of systems and information against damage or denial of use.

Software--computer programs, routines, and programming languages and systems.

SSA--the Social Security Administration.

SSADARS--Social Security Administration Data Acquisition and Response System. This is a computer-communications system providing on-line access from some SSA district offices and program service centers to some of the records maintained in the Baltimore center.

SSN--social security number. The number associated with each "enumerated" SSA client.

Terminal--a device serving as an input and/or output interface with a computer, communication, or information system. Often restricted in meaning to input/output devices used by people, and sometimes restricted further to input/output devices used by people in on-line interaction. A terminal often services both input and output functions, and usually includes a keyboard and a display. The broader senses of "terminal" include optical character readers and printers as well as teletypewriters and television-like display units with associated keyboards.

TEF--the Test and Evaluation Facility created by SSA to study human factors considerations pertinent to the future process.

Teleservice Center--An SSA facility from which SSA personnel deal with SSA clients by telephone.

Transparent (conduit)--a telecommunications path (system) that delivers information in the same form in which it receives it.

Transition--the change from one procedure, mode, or system to another. The transition referred to in this document relates specifically to the change from the current SSA process to the future one.

Users--(in the future process) - SSA employees, particularly those in local offices, teleservice centers, and program service centers, who will work with the future system.

Whole-Person Concept--a system design concept that would interrelate all information about each individual client. Thus, any change to information about an individual--for example, an address change--would need to be input only once in order to change all pertinent records.

Vertical Slice--a term associated with two of the three transition plans considered in this report: in one all future process services would be activited in a few district offices prior to being implemented throughout the system; in the other, complete subsystems would be upgraded as a prerequisite to future process services being activated. See Figure 1 (page 19).